

matters. Tables iii. to vi., p. 23, and numerous curves deal with diurnal variation of vapour pressure at Parc St. Maur, and at Blue Hill at several levels. Tables vii. and viii. and Chart xii. deal with electric potential at Greenwich for each month of the year, and with seasonal data at Perpignan and Paris. From a study of these the author advances in Chart xiii., sect. ii., as the representative curve of the diurnal inequality one possessing five maxima! A very similar curve—based on results by Zölss and Gockel—is given for electric dissipation. The conclusions embodied in these curves cannot be recommended for general acceptance. The same remark applies to the conclusion, on p. 21, that “the (earth’s) electrostatic field varies inversely to that of the solar energy.” The sole basis for this view seems to be Table ix., p. 24, and Fig. 53, which are regarded as proving a parallel variation from year to year between the number of solar prominences and the reciprocal of a quantity supposed to represent the mean annual potential gradient at Greenwich.

The diurnal variation of the magnetic field seems to be ascribed to up and down movements of positive ions in the atmosphere; these are supposed to indulge a preference for cold air during the day. As to magnetic storms, the author’s theory is even less clearly stated, but he apparently regards it as supported by the rapid rise towards 1 p.m. in the frequency figures given by Mr. Maunder for the hour of commencement of magnetic storms at Greenwich from 1882 to 1903. The author is presumably unaware that Mr. Maunder has since attributed this sudden rise to a cause having nothing to do with terrestrial magnetism, and that it is not shown in figures he has given for the epoch 1848 to 1881 (*cf. Phil. Mag.*, September, 1905, p. 306). In opposition to the theory advanced by Prof. Schuster and others, that the magnetic diurnal inequality is due to electric currents in the upper atmosphere, the author contends that the source is more directly thermal and confined to the lowest two miles of the atmosphere. A comparatively short series of simultaneous observations at suitably chosen high- and low-level stations should be fairly decisive for or against Prof. Bigelow’s contention.

In the above criticisms the author has been regarded as a scientific man whose aim is to convey scientific ideas to other scientific men. If his aim is simply to convey to an unscientific public a general idea of the problems which present themselves in cosmical physics, with the view of impressing the imagination rather than of appealing to the intelligence, the case is no doubt different. But on either hypothesis, what useful purpose is likely to be served by the indiscriminate collection of statistics and the enunciation of vague, hasty theories? A sparing use of theory may serve as a lubricant, but theory when heaped upon theory is simply dust clogging the wheels of science.

CHARLES CHREE.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

MR. J. J. WELCH has been appointed to the newly-established chair of naval architecture at the Armstrong College, Newcastle.

It is announced in the *Lancet* that the late Dr. Gustave Schorstein bequeathed 500*l.* to the regius professor of medicine at the University of Oxford for the pathological department of the medical school, 500*l.* to the London Hospital, and a sum, which will probably amount to some 10,000*l.*, in trust to the University of Oxford, subject to certain life interests. When these are expired the capital is to be at the disposal of the University for use as the University may think fit.

THE following courses of lectures for teachers have been arranged, among others, at University College, London, in conjunction with the education committee of the London County Council:—“The Teaching of Geography to Children,” Prof. Lyde; “Some Types of Vegetation and the Conditions under which they Exist,” Dr. Fritsch, both courses beginning on January 17; and “The Principles of Electrical Science during the Past 150 Years,” Prof. Trouton, beginning on January 19.

NO. 1938, VOL. 75]

THE preliminary programme of the second International Congress on School Hygiene, to be held on August 5–10, 1907, at the University of London, South Kensington, has been issued. The work of the congress will be divided into eleven sections, each presided over by an authority on the subject dealt with. The organising committee is inviting educational and public health authorities, universities, colleges, schools, societies, and others to appoint delegates to the meeting, and is appealing for donations to meet the large expenditure involved in organising the congress, which it is estimated will be not less than 3000*l.* The president of the congress is Sir Lauder Brunton, F.R.S., and the hon. secretaries are Dr. James. Kerr and Mr. E. White Wallis.

THE report of the Board of Education for the year 1905–6 is of an encouraging nature. There is plenty of evidence provided that our national system of technical education continues steadily to improve. The report points out that much attention has been paid throughout the country to the extension and improvement of the facilities provided for continuative education. There has been marked activity in the establishment of courses of instruction affording special technical training, and the effective character of the many courses organised under varied conditions shows that local circumstances have received the consideration necessary for success in this kind of educational work. Technical institutions affording whole-time training for those who can give two or more years to study after completing a secondary-school course have improved and multiplied their courses of technical instruction. The multiplication of courses requiring the whole time of students is a gratifying indication of the growing appreciation of the value of the work of the technical school; but this appreciation is not confined to whole-time instruction. The improved organisation of the varied institutions engaged in supplementing the training which a youth receives in the office or workshop has borne fruit in many practical developments, demonstrating the extent to which such further education may become a recognised element in the lives of our youths. The report, which runs to 106 pages, deals fully with every department of elementary, secondary, and technical education, and shows conclusively that, political controversy notwithstanding, valuable work is being accomplished in the schools.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society November 22.—“The Structure of Nerve Fibres.” By J. S. Macdonald. Communicated by Prof. C. S. Sherrington, F.R.S.

Nerve fibres teased in harmless saline solutions and examined under the microscope exhibit a series of varied appearances which are distributed in a constant order in the length of the fibre. This orderly distribution is explained as due to the electrical current which traverses the fibre inwards from each injured point, and which leaves the fibre to traverse the salt solution at certain definite “kathodal” points.

At each injured point, the source of the current, the colloid material is precipitated and is surrounded by an aqueous solution. By the use of definite reagents the solution is found to be a concentrated solution of a potassium salt, probably potassium chloride. The author in a previous paper has directed attention to the importance of this fact, when injury is considered as the fatal consequence of a violent “excitation,” and to the probability that “excitation” is the outcome of such a desolution of colloid material and liberation of inorganic salt to diffuse and give rise to electrical change. At kathodal points a similar set of conditions is observed, in origin secondary to those already described at the current source.

The injury region is abruptly limited by an adjacent “anodal region,” where the material of the nerve fibre has an exceptionally fluid appearance, except in so far as this fluidity is disturbed by secondary acid formation and diffusion.

The anodal region passes into the kathodal region through a graduated series of coagulative change, attended

by an increasing density of granule formations (precipitated proteid).

The distribution of potassium salt in the solutions within the fibre can be mapped out, not only by definite potassium precipitants, but also by dyes which are "salted out" by potassium salts. This fact is held to be of importance where in other recorded instances the "staining" effects of these dyes have been observed in nerve cells and in cells of secretory glands, since in these cases also the staining effects observed may be due to intracellular solutions of inorganic salts.

The author has also made observations upon the form in which the proteid matter is precipitated in regions of the fibre of different coagulation intensity. These observations have resulted in the opinion that the "neurofibrils," which are commonly described as structural elements of nerve fibres, are precipitates of proteid making an appearance only when the conditions determining coagulation have a certain low value.

November 22.—"On Opsonins in Relation to Red Blood-cells." By Dr. J. O. Wakelin **Barratt**. Communicated by Dr. C. J. Martin, F.R.S.

It is shown that—

(1) By employing phagocytosis as a test of the presence of red blood-cell opsonin, and avoiding spontaneous phagocytosis by suitable conditions of experiment, quantitative determinations of the opsonic content of serum may be made.

(2) In the experiments made, the interaction of opsonin and red blood-cell proceeded at a rate corresponding to that exhibited in a bimolecular stoichiometric reaction.

Royal Microscopical Society, November 21.—Mr. A. N. Disney, vice-president, in the chair.—The use of a top stop for developing latent powers of the microscope: J. W. **Gordon**. The author exhibited his apparatus, which had previously been shown to the society, and pointed out that a top stop enables the microscopist to vary the proportion between the refracted and the unrefracted light which passes the instrument, and thus to render conspicuous a particular feature of the object. In illustration of the results thus reached, he exhibited photographs taken with an achromatic oil-immersion objective of N.A. 1.0 to demonstrate how, by means of a top stop, the objective in question could be made to equal the performance of an objective of much wider aperture.

Physical Society, November 23.—Prof. J. Perry, F.R.S., president, in the chair.—Electric radiation from bent antennae: Prof. J. A. **Fleming**. An account of experiments at University College, London, with radiating antennae consisting of bent wires having the property of radiating electric waves more strongly in some directions than others. The receiving arrangement consisted of a thermoelectric oscillation-detector contained in a double test-tube like a Dewar vacuum-vessel. Four copper strips pass down the inner tube, and platinum wires soldered to them are sealed through the glass. One pair of these are connected by a fine constantan wire, and the other pair by a tellurium-bismuth thermojunction. A high vacuum is made between the test-tubes. If electric oscillations are sent through the constantan wire and a galvanometer connected to the thermojunction, this receiver can measure the root-mean-square value of the oscillations induced in any receiving antenna when the fine wire is inserted between the antenna and the earth. The receiver used gave deflections almost exactly proportional to the square of the current passing through the fine wire. This receiver was inserted between an earth-plate and a vertical receiving antenna. The transmitting antenna consisted of a similar wire and plate. Readings were taken of the current in the receiving antenna, and plotted out as polar curves corresponding to the various directions of the free end of the transmitter. Curves show that the intensity of radiation in various azimuths for constant distance between receiver and transmitter becomes more unequal as the ratio of horizontal to vertical part of the transmitter increases. Also all the polar curves show a minimum radiation corresponding to a direction of the free end of the transmitter such that it makes an angle of 70° to 75° with the line joining the earthed points of the transmitter

and receiver. The form of the polar curve observed for the same sending antenna, but with different distances between sender and receiver, varies as it should do by theory. A large number of forms of antenna were examined. Similar effects observed by Mr. Marconi in the case of bent receiving antennae are explained, and it is shown that these effects cannot be explained without admitting three sources of electromotive force in the bent receiving antennae:—(1) that due to the magnetic force of the incident wave; (2) that due to the electric force; and (3) an electromotive force due to the periodic insertion and removal of lines of magnetic force from the nearly closed loop formed by the bent antennae.—Auroral and sun-spot frequencies contrasted: Dr. C. **Chree**. The author has already investigated the relationships between certain phenomena of terrestrial magnetism and sun-spot frequency. The present paper makes similar comparisons between sun-spot frequency and the frequency of auroras. The sun-spot data utilised are from the big table of Wolf and Wolfer, covering the long period 1749 to 1901. Mean values have been calculated from this table for each month of the year. One object was to see whether there was appreciable variation in the mean sun-spot frequencies for individual months of the year. The differences between the means for individual months proved to be by no means negligible when calculated from thirty-three consecutive years, or from groups of thirty-three or thirty-nine years selected as representing sun-spot maximum and minimum. A comparison is instituted between mean sun-spot frequencies and mean auroral frequencies calculated for the same group of years. During the periods dealt with there seemed reason to believe that variation occurred in the unit of auroral frequency. To eliminate such uncertainties as far as possible, a period, say, poor in sun-spots, is contrasted with two equal periods rich in sun-spots, one preceding and the other following it. An investigation is made as to whether the annual variation of auroral frequency is the same in years of many as in years of few sun-spots. The evidence is not perhaps altogether decisive, but, so far as it goes, it points to the conclusion that, relatively considered, the annual variation is more pronounced when sun-spots are few than when they are numerous. There seems, however, to be a conspicuous difference between the variation in the annual auroral frequencies derived from the south and the north of Scandinavia. At first sight the much greater length of time for which records exist suggests that aurora lends itself more readily than terrestrial magnetism to a comparison with sun-spots.—The electrical resistances of alloys: Dr. R. S. **Willows**. Lord Rayleigh has given a theory intended to account for the high resistance of alloys compared with that of the constituent metals. The author attempts to put this theory in evidence by measuring the resistance of an alloy with direct and also alternating currents. At the instant of reversal of the latter the back E.M.F. will assist the external E.M.F., and hence more current will pass, i.e. the resistance will apparently be reduced. No spurious resistance could be detected. A minimum accuracy of 0.02 per cent. is attained.

Mathematical Society, December 13.—Prof. W. Burnside, president, in the chair.—The form of the surface of a searchlight reflector: C. S. **Jackson**. The light from a source must be reflected so as to pass horizontally through a narrow vertical slit. The equation of the surface is found to be of the form $r + \rho = \text{const.}$, where r is the distance of a point on the surface from the source, treated as a point, and ρ is the perpendicular distance of the same point of the surface from the slit, treated as a vertical line. The practical construction of the surface is explained.—The Diophantine equation $x^n - Ny^n = z$: Major P. A. **MacMahon**. A method is explained for obtaining the arithmetically independent solutions of the Diophantine inequality $\lambda x \geq \mu y$ by forming the descending intermediate series of convergents to the continued fraction μ/λ . The forms of the arithmetically independent solutions of the Diophantine inequality $x \geq Ny$ are deduced, and the properties of the number z , which can have the form $x^n - Ny^n$, are determined.—Asymptotic expansion of integral functions defined by generalised hypergeometric series: Dr. E. W. **Barnes**. The series in question satisfy

a linear differential equation which is a generalised form of that satisfied by the ordinary hypergeometric series, and the asymptotic expansions are related to the form of the differential equation. In the most important cases the asymptotic expansions become exponentially infinite at infinite distances.—The potential equation and others with function given on the boundary: L. F. **Richardson**. The paper suggests a tentative method for arriving at an approximate solution of the problem of steady flow of heat in a homogeneous solid with given surface temperature by beginning with the problem of variable flow in a solid of variable diffusivity which tends to zero on the boundary.—The limits of real variants: J. **Mercer**. The paper is occupied with generalisations of Cauchy's theorem which is expressed by the formula

$$\lim_{n \rightarrow \infty} (X_{n+1} - X_n) = \lim_{n \rightarrow \infty} (n^{-1} X_n).$$

Royal Astronomical Society, December 14.—Mr. W. H. Maw, president, in the chair.—Solar parallax papers, No. 5: examination of the photographic places of stars published in the Paris Eros Circular: A. R. **Hinks**. Comparisons had been made of the photographic places of stars obtained at Paris, Bordeaux, Catania, San Fernando, Toulouse, and Algiers, showing many discordances, some of considerable amount. The Algiers places were specially affected by "magnitude equation," the cause of which was very obscure. It appeared that many of the star places are affected by errors much larger than those considered permissible in the Astrographic Catalogue.—Account of the Oxford Astrographic Catalogue, vol. i.: H. H. **Turner**. The volume in question, which has just been published, contains measures of rectangular coordinates and diameters of star images on plates with centres in dec. $+31^\circ$. The complete catalogue will consist of eight volumes, one of which will be devoted to discussions.—Notes on some spectroscopic observations of the sun: H. F. **Newall**. The observations were first made with the 25-inch equatorial at Cambridge (the Newall telescope), and later with a fixed horizontal telescope, a coelostat, and auxiliary mirror; the latter equipment appeared to possess considerable advantages. An account was given of the preliminary experiments; the instrumental arrangements were described, and some results were given of the photographic study of the bands and flutings in the spectra of sun-spots.—Note on the approaching return of Halley's comet: A. C. D. **Crommelin**. The author directed attention to a paper by Dr. A. J. Ångström published in 1862, in which a mean period for the comet of 76.93 years was deduced, with inequalities due to the action of Jupiter and Saturn. Dr. Ångström's results give 1913.08 for the time of the next perihelion passage, while that given by the Count de Pontécoulant is 1910.37. In view of this large discrepancy of 2.7 years, it is most desirable that the perturbations should be independently computed. Before the last return, in 1835, there were at least five independent determinations of the orbit, and it would be a great misfortune if there is a serious error in the prediction of this return after the great success achieved in 1759 and 1835.—Photographs of Mira Ceti in 1897 and 1906, by Father **Sidgreaves**, were shown. There were marked differences in the relative intensities of the hydrogen lines.—Dr. **Lockyer** also showed photographs of the star taken at its present maximum.

MANCHESTER.

Literary and Philosophical Society, November 13.—Mr. C. Bailey in the chair.—Luminosity produced by the rubbing or knocking together of various forms of silica: R. L. **Taylor**. The luminosity is connected in some way with the breaking away of small particles, mostly in the form of dust. Mr. Joseph Burton finds that whereas ordinary felspar only shows this property in a very small degree, the same substance previously heated almost to fusion shows it nearly as well as quartz. Common glass does not show it, but a specimen of glass "frit," rich in lead and very hard, does to a slight extent. The luminosity may be partly due to the hardness of the material, but that it is not entirely so is shown by the fact that whereas a slight luminosity is shown when a piece of corundum or a piece of native emery is rubbed against a piece of silica, there is none whatever when two pieces of corundum or

two pieces of native emery are knocked together. There is a curious odour produced by the impact of any of these bodies which become luminous, an odour which has been compared to that of ozone, but Mr. Taylor has not been able to verify that observation. Mr. F. Jones and Mr. Burton also made careful tests for ozone, and both failed to obtain any evidence of its presence.—The proembryo and bulbils of *Lamprothamnus alopecuroides* (Braun): Miss M. **McNicol**. This plant, which occurs in various countries of Europe and also in Africa, is characterised by the possession of unicellular bulbils or tubercles, formed by the transformation of rhizoids.

CAMBRIDGE.

Philosophical Society, November 12.—Dr. Hobson, president, in the chair.—(1) Electrification produced by heating salts; (2) secondary Röntgen rays: Prof. **Thomson**.—The specific heat of gases at constant volume and high pressure: W. A. D. **Rudge**. The author has determined the specific heat of carbonic acid by heating the gas in small steel bulbs immersed in a calorimeter containing paraffin. The value obtained was about 0.45 for a temperature range of from 36° to 60° , when the gas was under a pressure of about 480 atmospheres.—The radioactivity of the alkali metals: N. R. **Campbell** and A. **Wood**. It is found that potassium salts show a greater radio-activity than any substance examined which does not contain a "radio-active element." The activity is an atomic property, and is not due to any impurity. The rays from potassium vary in penetrating power; the most penetrating rays are similar to the β rays from uranium. An activity of the same nature is observed in rubidium, but could not be detected in caesium, sodium, or lithium. The rays from rubidium are far less penetrating than those from potassium. The ionisation caused by the rays from potassium is about 1/1000 of that caused by the β rays from a similar quantity of uranium. An apparently successful attempt has been made to obtain a photographic impression caused by the rays from potassium.—A relation between the ionic velocity and the volume of organic ions in aqueous solutions: G. A. **Carse** and T. H. **Laby**. This is a continuation of a previous paper (Proc. Camb. Phil. Soc., xiii., p. 287, 1906). It is found that the product ionic velocity \times linear dimension of the ion, or va , is sensibly constant for the ions of twenty-two amines, the mean value being 20.2, for seven homologues of aniline 18.8, for thirteen pyridines and quinolines 20.3, for five phosphines 17.6, &c. The linear dimension of an ion is taken as proportional to the cube root of the ionic volume, which is deduced from molecular and atomic volumes. It is shown from hydrodynamical considerations that $va = \text{const.} \times (\text{term depending on ionic shape})$.

November 26.—Dr. Fenton, vice-president, in the chair.—A delicate reaction for carbohydrates: Dr. **Fenton**. When bromo- or chloro-methylfurfural reacts with sodio-malonic ester in alcoholic solution, a product is obtained solutions of which exhibit an intense blue fluorescence. The reaction is extremely delicate, and serves to detect the most minute trace of the above-named derivatives of methylfurfural. It is further shown that all hexoses and polysaccharides, glucosides, &c., which contain a hexose residue yield bromo-methylfurfural when acted upon by hydrogen bromide under appropriate conditions, and they may therefore be readily identified by the formation of this fluorescent product.—Xanthoxalanil and its analogues: S. **Ruhemann**. The author has studied the action of ethyl oxalate on acetanilide in the presence of sodium ethoxide, and has found that the compound thus formed, which is called xanthoxalanil, has the formula $\text{C}_{20}\text{H}_{12}\text{O}_8\text{N}_2$.—The influence of a strong magnetic field on the spark spectra of titanium, chromium, and manganese: J. E. **Purvis**. The strength of the field was 40,000 units, and Prof. Liveing's 21-feet concave grating spectroscope was used. The general results showed that most of the lines were divided into triplets of which the middle constituent was at least twice as strong as the two outside ones, although the three constituents of several lines appeared to be more nearly equal. A number of lines were divided into four, and the two outside constituents of some were weaker and more diffuse than the two middle ones, whilst in several they appeared to be equally strong.

Chromium λ 2866.80 appeared to divide into eight, only seen separately when analysed by a calcite prism; 3147.23, 2855.73, 2757.75 were divided into six, also only seen separated on analysis; and 2861 is divided into five. The titanium line 3252.03 is divided into six. The distances of the constituents of the divided lines were measured for a considerable number of the strongest lines, and the values of $d\lambda/\lambda^2$ calculated from them. It appeared that amongst the lines which had more than three constituents, the values for several were simple multiples of one another, and in several instances the constituents of different lines had the same values, the same general appearance and polarisation. Also the values of $d\lambda/\lambda^2$ for some lines appeared to be simple multiples of those of other lines.—The solubility of stereoisomerides in optically active solvents: H. O. Jones. The statement, found in certain text-books, that the solubility of two optical antimers *must* be different in an optically active solvent has been put to the test of experiment, and it has been found untrue. In the cases of *d*- and *l*-camphoroximes and of *d*- and *l*-camphors in *l*-amylbromide and in dextrorotatory turpentine as solvents, the solubility of the *d* and *l* compounds was found to be the same.—Estimation of copper: W. H. Foster. An attempt to employ the method of Wood and Berry for the estimation of sugar, and that of Jones and Carpenter for the estimation of hydroxylamine, to the determination of copper, especially in mixtures. The method was found to be simple and accurate with copper solutions, using grape-sugar as reducing agent. With mixtures of copper and other metals the results were generally unsatisfactory, being high when sugar was the reducing agent employed, and low when hydroxylamine was used. Phenylhydrazine gave better results than hydroxylamine, but these were also below those required by theory. The method, which is really a modification of that of Schwarz, can be recommended for solutions of copper salts alone, or for solutions containing only small quantities of other metals.—The maturation of the germ-cells in the saw-fly, *Nematus ribesii* (third note): L. Doncaster.

DUBLIN.

Royal Dublin Society, November 20.—Sir Howard Grubb, F.R.S., vice-president, in the chair.—Some injurious fungi found in Ireland: Prof. T. Johnson. The author dealt with certain fungal diseases, mainly from the economic aspect, such as yellow-blight and scab in the potato, "Phoma" rot in mangel and turnip; onion rot, and barley leaf-streak. The paper ended with an account of the author's discovery of the American gooseberry mildew on the red currant in co. Kilkenny, and of the steps taken by the Irish Government to check the spread of this mildew in Ireland.—A contribution to the study of evaporation from water surfaces: J. R. Sutton. The observations and experiments were made at Kimberley, South Africa, and under meteorological conditions, *i.e.* in the open air. It is provisionally concluded that while differences between the vapour tensions at the water surface and in the open air are competent to influence the rate of evaporation to a large extent, the intensity of the effect of vapour-tension differences is profoundly modified by the relation the temperature of the dew point bears to the temperature of the air, or, in other words, is profoundly modified by the relative humidity. The water temperatures are, as such, probably of no great importance, initially, at any rate; but when considered in conjunction with the temperature and relative humidity of the air, an influence becomes apparent which, so far as is known, has not hitherto received due recognition. It seems to be extremely probable that after the relative humidity of the open air and the difference of vapour tension have been allowed for, much of the observed evaporation, from whatsoever form of water surface or type of gauge, is due to convection currents. The effects of insolation are discussed, both as regards evaporation at sea and from land surfaces, and the conclusion is drawn that too much importance has hitherto been attributed to this source of energy. In a series of experiments on the effects of electrification, no difference was detected between the evaporation from insulated and uninsulated copper evaporating vessels, other than trifling differences which may be due to experimental error.

NO. 1938, VOL. 75]

EDINBURGH.

Royal Society, November 19.—Dr. R. H. Traquair in the chair.—A new Siphonogordid genus, with descriptions of three new species: J. J. Simpson. These organisms were obtained from the shallow waters of the Indian Ocean, and presented features which quite differentiated them from the other known genera of the same family.—Cranio-metric observations on the skull of *Equus prejevalskii* and other horses: Prof. O. Charnock Bradley. The general conclusions were that the wild horse had a long, narrow face, the Icelandic or forest type a short, broad face, while the Celtic type occupied an intermediate position; that the orbit of the wild horse was elongated and placed far back as compared with the rounded orbits of the two other types.—Skulls of horses from the Roman fort at Newstead, near Melrose, with observations on the origin of domestic horses: Prof. J. C. Ewart. From a careful study of these skulls, thirteen in all, the author obtained fresh evidence in support of his theory that the present domesticated horses are descended from three distinct types, namely, the wild horse of the Gobi Desert, the Celtic type, and the forest type. The evidence from length and shape of skull, and from the estimated heights of the horses of which the skulls had been found near Melrose, was thoroughly examined, and there seemed little doubt that the Romans possessed horses of from twelve to fifteen hands in height belonging to the three types named. A remarkable feature which seemed to have hitherto escaped notice was the manner in which the forward part of the skull was bent with reference to the base, giving to some types a Roman-nose aspect, to others a straight form of face. An interesting point was that the amount of bending varied with the age of the animal, being (for example) bent at birth in the case of the wild horse, then becoming straight at sixteen months, and, finally, bent again in the adult.—The inversion of cane sugar by optically active acids: Theodore Rettie and Dr. W. W. Taylor.

December 3.—Prof. Crum Brown, vice-president, in the chair.—The sporulation of *Amoeba proteus*: Prof. J. Y. Simpson. The paper gave an account of the sporulation in *Amoeba proteus* without encystment, describing certain specific nuclear changes, and raising some questions in connection with the nuclear changes in the allied species *Pelomyxa palustris*.—Results of removal and transplantation of ovaries: Dr. F. H. A. Marshall and W. A. Jolly.—The influence of an excessive meat diet on the osseous system: Dr. Chalmers Watson.—The effects of a meat diet on fertility and lactation: Dr. B. P. Watson.—The effects of a meat diet on the minute structure of the uterus: Drs. Malcolm Campbell and Chalmers Watson. These three papers treated of different aspects of the same general question. In the first it was shown that in the offspring of rats fed on an excessive meat diet the osseous system was defective. The bones were invariably too soft and vascular, and frequently showed structural changes like those of rickets in the human subject. The blood-forming cells in the bone marrow were also affected, being at first increased in number and later diminished. In the second paper it was demonstrated that the reproductive power of rats fed on an excessive meat diet was much below that of rats fed on a bread-and-milk diet. Further, when the meat-fed rats had litters they were less able to feed their young owing to smaller development of mammary tissue. The third paper contained a description of the minute structure of the lining membranes of the uterus in rats fed on different diets. The prolonged use of an unphysiological diet, such as an excessive meat diet, induced structural changes in the mucous membrane of the uterus, and these changes were most pronounced in animals in which the faulty feeding was begun when the animals were weaned. Such animals were invariably sterile.—The minors of a product determinant: Dr. Thomas Muir.

PARIS.

Academy of Sciences, December 10.—M. H. Poincaré in the chair.—The division of labour amongst bees: Gaston Bonnier. The author's experiments during last summer show that the division of labour is carried out to a surprising extent amongst bees. Bees which are seeking for

pollen or nectar do not carry it, but merely carry the news to the hive. A number of bees are sent out to strip the flowers, a number carrying pollen only, others nectar only, others again water only, when water is needed. The number sent out is proportional to the number of flowers to be stripped, and by marking the bees with coloured talc it was proved that each bee confined itself for the time being to one class of work. The same bee might be seeking for flowers in the morning and collecting in the afternoon, but did not change the nature of its work without returning to the hive. There seemed to be something in the nature of a working arrangement between the bees of different hives, as when the work of clearing a certain area of flowers had once been commenced by a few bees from one hive, these collectors were not interfered with by bees from other hives.—Some scientific discoveries of Leonardo da Vinci: P. **Duhem**. A study of the effect of the scientific writings of Leonardo da Vinci on the work of Mersenne, Roberval, Descartes, Fabry, and Huygens.—Glycosuria without hyperglycemia: R. **Lépine** and M. **Boulud**.—The theory of ensembles: Félix **Bernstein**.—The power of orthogonal systems of continuous functions: Erhard **Schmidt**.—The calculation of limits: L. **Fejér**.—A class of differential equations reducible to linear equations: M. **Riviereau**.—The phenomena of magnetic rotatory polarisation in crystals: Jean **Becquerel**.—The motor effects of high frequency currents: H. **Guilleminot**.—A colour reaction given by reducing sugars by *m*-dinitrobenzene in alkaline solution: MM. **Chavassieu** and **Morel**. A violet colouring matter is produced. It is neither more nor less characteristic than other colour reactions of aldoses and ketoses, but has the advantage of being very easy to carry out.—A tetrabromo-derivative of methylethylketone: M. **Pastureau**. The ketone is converted into a peroxide by the action of hydrogen peroxide in acid solution, and this submitted to the action of bromine. The tetrabromide thus formed has been shown to have the constitution $\text{CH}_2\text{Br}-\text{CO}-\text{CH}_2-\text{CBr}_3$, since when heated with potassium carbonate it gives acetol.—The distribution of phosphorus in foods: M. **Balland**.—The distribution of vicianine and of its diastase in the seeds of Leguminosæ: Gabriel **Bertrand** and Mlle. L. **Rivkind**. About forty species were examined, and most of them were found to contain a diastase capable of hydrolysing vicianine. The glucoside was only found in plants of the genus *Vicia*, and the distribution of the two substances was very irregular even in this one genus. *Vicia narbonensis*, for example, contains neither diastase nor vicianine.—The composition of vegetable juices extracted from roots: G. **André**.—The respiration of seeds in the state of latent life: Paul **Becquerel**. It has been found that light, the teguments of the seed, and the state of hydration are all important factors in the respiration of the seed, and the effect of these may be sufficient to explain the variable results obtained by different workers on this subject.—Pollen, its origin and transformation: Germand **Vert**.—A tumour in an invertebrate, *Sipunculus nudus*: Marcel A. **Hérubel**.—A new order of dinoflagellated parasites, Blastodiniæ: Edouard **Chatton**.—The interpretation of some results in radiotherapy and an attempt at fixing a rational technique: J. **Bergonié** and L. **Tribondeau**.—The conglomerates of Messina and those of the Glökova-Varassova synclinal in Greece: Ph. **Négreis**.

CALCUTTA.

Asiatic Society of Bengal, November 7.—Latitude of the Presidency College Observatory: Babu Phanindra Lal **Ganguli**. A simplified method of making approximate calculations in recording observations at the Presidency College Observatory.—Further notes on earwigs (Dermaptera) in the Indian Museum, with the description of a new species: M. **Burr**. Records of new localities and the description of a new species of the genus *Anisolabis*.—Notes on the habits of the earwig, *Labidura lividipes*, Dufour: Dr. N. **Annandale**. This earwig is sometimes very common at light during the hot weather and rains. It uses its forceps in opening and folding its wings.—Cirrhépèdes Operculés de l'Indian Museum, de Calcutta: M. A. **Gruevel**. An account of the sessile barnacles of the Indian Museum collection, with descriptions of a new genus,

Pyrgopsis, and of new species, four of the genus *Verruca* and one of *Balanus*. The genus *Pyrgopsis* is allied to *Pyrgoma*.—Note on the Houbara or bastard bustard (*Houbara macqueenii*): Lieut.-Colonel D. C. **Phillott**. An account of the habits of this bird, its food, way of hiding, &c.—Descriptions of two new Indian frogs: G. A. **Boulenger**. The species are *Rhacophorus taeniatus* from the plains of Bengal, and *Ixalus annandalii* from the Sikkim Himalaya.—Notes on pollination of flowers in India, Nos. 1-3: I. H. **Burkill**. The author describes (1) the pollination of *Thunbergia grandiflora* in Calcutta by the boring bees, *Xylocopa latipes* and *X. aestuans*; (2) the pollination of *Corchorus capsularis* and *C. olitorius*—the two 'jute plants'—in many places in Bengal and Assam; (3) the pollination, as observed in the Simla Hills, of the flowers of *Adhatoda vasica*, *Dicliptera bupleuroides*, *Morina persica*, *Salvia lanata*, *Scutellaria linearis*, and *Teucrium royleanum*.—*Ascaris lobulata*, Schneider, ein Parasit aus des Darms von *Platanista gangetica*: Dr. v. **Linstow**. A brief note upon the features of this parasitic worm.—Notes on the fresh-water fauna of India, No. ix., descriptions of new fresh-water sponges from Calcutta, with a record of two known species from the Himalayas and a list of the Indian forms: Dr. N. **Annandale**. Two new species and a new variety of *Spongilla*, a new species of *Ephydatia*, and two of *Trochospongilla* are described from a tank in Calcutta. *Spongilla carteri*, Bowerbank, and *Ephydatia robusta*, Potts, are recorded from a lake situated at the height of 4500 feet above sea-level in the Central Himalayas, on the evidence of floating gemmules. The list of Indian fresh-water sponges now includes nine species and varieties of *Spongilla*, four of *Ephydatia*, and two of *Trochospongilla*. The species recorded from Bombay are mostly different from those occurring in Calcutta.—Notes on fresh-water fauna of India, No. x., *Hydra orientalis* during the rains: Dr. N. **Annandale**. Four-tentacled individuals of the polyp have been found during the rains bearing four-tentacled buds, but without sexual organs. At this season they confine themselves to deep and densely shaded parts of the tank, and are small and colourless.

NEW SOUTH WALES.

Royal Society, September 5.—Mr. H. A. Lenehan, vice-president, in the chair.—Port Sydney: L. **Hargrave**. The paper showed how Port Jackson might be made an up-to-date port without tampering with vested interests, present traffic, or riparian rights. The accommodation shown was 8000 yards of quay, with 40 feet of water; six miles from Redfern.—The international rules of botanical nomenclature (adopted by the International Botanical Congress of Vienna, 1905): J. H. **Maiden**. The author gives an account of the modern attempts to evolve laws for a settled nomenclature, beginning at the International Botanical Congress of Paris, 1867.

Linnean Society, October 31.—Mr. Henry Deane, vice-president, in the chair.—Contribution to our knowledge of the action of rennin: A. H. **Moseley** and Dr. H. G. **Chapman**. It was noted (1) that when milk which showed an acid reaction to litmus was neutralised with alkali, rennin ceased to produce its customary clot, and (2) that the addition of quantities of alkali insufficient to produce neutrality of reaction to litmus inhibited the clotting of the milk with rennin. Upon investigation it was found that this action was due to destruction of rennin by hydroxyl ions, and was not dependent on any specific action of the sodium or potassium ion upon caseinogen or casein.—The geology of Samoa, and the eruptions in Savaii: H. I. **Jensen**. The phenomena presented by the Savaiian volcano afford some clue to the direction in which to look for future developments in the forecasting of earthquakes and eruptions. The eruption at Savaii was due to a movement along the great structural line between Samoa and New Zealand which opened the fissure in 1902. The increase of folding consequent upon rise of the isogeotherms accompanying the sun-spot maximum of 1905 caused the re-melting of magmas at a depth, and squeezed them into the fissure, whence they have been escaping from several vents. The ingress of sea-water has had something to do with the eruption, as shown by the hydrochloric acid evolved, and it should be

mentioned that the rainy season, January to March, was that of greatest activity. Many points of resemblance between Samoan and Hawaiian lavas command attention.—Sand-movement on the New South Wales coast: G. H. **Halligan**. The principal factors which govern the movement of sand and shingle on the littoral being ocean and tidal currents, wave action, and wind, the following matters are discussed:—the effects of strong and weak currents, counter currents, and currents due to tidal flow upon the direction and rate of sand-travel; the movement of beach material due to tidal current a negligible quantity; sand-movement more pronounced during flood tide as compared with ebb tide; a projecting headland may cause a current on its northern or southern side, according as its northern side is concave or convex, or whether the headland is at right angles to the course of the current, or meets it at an angle; the influence of the prevailing and the dominant winds upon sand-travel as shown by an analysis of the winds recorded at Sydney during the decade 1894–1903, and at the Clarence River from March, 1877, to August, 1886; the manner in which sand and shingle are moved by wave action and by currents, and the reasons why the sand on the coast of New South Wales is more readily moved to the south than to the north, where strong eddy currents do not exist; predominant influence of the strong southerly winds on the movement of sand above the limit of wave action, with instances of the northerly movement of sand-dunes on the coast.—The minerals and genesis of the veins and “Schlieren” traversing the ægirine-syenite in the Bowral quarries: D. **Mawson**. The veins ordinarily occupy fissures which may be very local, extending only a few inches, or at other times continuous by the establishment of connections between minor openings. They are classified as (1) veins of bitumen distilled from the underlying Coal-measures; (2) simple pegmatite veins of (a) small, and (b) of larger dimensions, which have originated by sweating from the sides, or by the residual gaseous and more liquid contents of the solidifying rock collecting largely in the same fashion, and crystallising out as a coarse-grained product; and (3) veins exhibiting well-marked flow-structure and of finer grain, more nearly related to the aplites.—The fixation of nitrogen by *Azotobacter chroococcum*: Dr. R. **Greig-Smith**. Azotobacter is a slime-forming microorganism, and in combination with other bacteria, such as *Bact. radiobacter* and *Bact. levaniiformans*, with which it appears to associate, it quickly produces a luxuriant growth of slime on saccharine media. There is also a fixation of nitrogen, but this, as has been pointed out by Beijerinck and v. Delden, is caused by Azotobacter, and not by the other bacteria, which, however, may render assistance.—The fixation of nitrogen by *Rhizobium leguminosarum*: Dr. R. **Greig-Smith**. The investigation showed that races of the nodule former can fix atmospheric nitrogen in artificial culture, and that the fixation is coincident with, and proportional to, the formation of slime. Under conditions which assist cell growth, but which preclude the formation of slime, there is no fixation, and conversely, under conditions which assist the formation, such as the presence of another bacterium, there is an increased fixation.

CAPE TOWN.

South African Philosophical Society, October 31.—Dr. J. C. Beattie, president, in the chair.—A series of mounted Cape Alcyonaria (Cœlenterates) obtained by the Government Biological Department: J. Stuart **Thomson**. The specimens exhibited were of remarkable beauty in form and colouring. One of the most interesting of the forms exhibited was *Anthoptilum thomsoni*, a colony measuring about 3 feet long and occurring in abundance at certain places, probably forming miniature animal forests at the bottom of the sea.—Connection between the rainfall at Durban and at Mauritius: T. F. **Clanton**. The note arises out of an inquiry into the possibility of seasonal weather forecasts for Mauritius. Examination shows that the monthly departures from average of the various meteorological elements at Durban have no connection with those at Mauritius. It appears, however, that winter droughts in Durban have invariably been followed by summer droughts in Mauritius at intervals of from three to seven

months, and that prolonged droughts in Natal or those commencing in the summer may be either accompanied or followed by prolonged droughts in Mauritius. There is some evidence to show that the interval depends upon the time of commencement of the drought at Durban.—Discussion of the errors of certain types of minimum spirit thermometers in use at the Royal Alfred Observatory, Mauritius: A. **Walter**. The conclusions arrived at are:—(1) the minimum thermometers (even the so-called “sensitive”) should never be used as ordinary thermometers; (2) the errors from comparisons at certain temperatures may be as much as 2°; (3) the absolute minima obtained with the spherical bulb thermometers may amount to as much as +3°.—The chemical composition of berry wax: Dr. B. **van der Riet**. In this paper the author drew a comparison between constants found for berry wax (from berries of *Myrica cordifolia*) and those quoted for myrtle wax (from berries of various species of *Myrica*), by Dr. J. Lewkowitsch in his treatise on the chemical analysis of oils, fats, and waxes.

DIARY OF SOCIETIES.

THURSDAY, DECEMBER 20.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Track Circuit as Installed on Steam Railways: H. G. Brown.
LINNEAN SOCIETY, at 8.—Botanical Results of the Third Tanganyika Expedition, 1904–5: Dr. A. B. Rendle and others.—Fossil Foraminifera of Victoria; the Balcombian Deposits of Port Phillip: F. Chapman.—*Exhibition*: Albino Woodlice: Wilfred Mark Webb.
CHEMICAL SOCIETY, at 8.30.—A New Laboratory Method for the preparation of Hydrogen Sulphide: F. R. L. Wilson.—The Reaction of Acids with Methyl Orange: V. H. Veley.—(1) Contributions to the Study of the Calcium Phosphates, I., The Hydrates of the Calcium Hydrogen Orthophosphates; (2) Contributions to the Study of the Calcium Phosphates, II., The Action of Ammonia Gas on the Calcium Hydrogen Orthophosphates: H. Bassett, jun.

THURSDAY, DECEMBER 27.

ROYAL INSTITUTION, at 3.—Signalling to a Distance: Ancient Ways of Signalling and their Modern Development: W. Duddell.

SATURDAY, DECEMBER 29.

ROYAL INSTITUTION, at 3.—Signalling to a Distance: the Invention of the Electric Telegraph: W. Duddell.

CONTENTS.

	PAGE
Two Histories of Chemistry	169
Monasticism	170
The Plants of Kumaon. By A. B. R.	171
Engineering Design and Drawing. By T. H. B.	172
Our Book Shelf:—	
Filchner: “Das Kloster Kumbum in Tibet.”—Lieut. Col. L. A. Waddell	172
Macpherson: “A Century’s Progress in Astronomy.”—W. E. R.	173
Wiles: “The World’s Calendar”	173
Letters to the Editor:—	
Cutting a Round Cake on Scientific Principles. (With Diagram.)—F. G.	173
Anode Rays.—Dr. R. S. Willows	173
The Development of Modern Artillery and Explosives. (Illustrated.) By J. S. B.	174
A Half-dozen Illustrated Nature Books. (Illustrated.)—By R. L.	176
The Treatment of Cancer	177
Nubian Antiquities	178
Notes	178
Our Astronomical Column:—	
Systematic Stellar Motions	182
The Spectrocomparator	182
Measurements of the Effective Wave-lengths in Stellar Spectra	182
Early Observations of Jupiter’s Sixth Satellite	182
Observations of the August Meteors	182
Geology in the United States and Canada. (Illustrated.)	182
Scientific Fishery Investigations	185
Agricultural Research	185
Some New Methods in Meteorology. Dr. Charles Chree, F.R.S.	186
University and Educational Intelligence	187
Societies and Academies	187
Diary of Societies	192